

REMARKS

Applicants note with appreciation the provisional allowance of claims 2-13 and 24-27. Claims 1-41 are currently pending in the application. Reconsideration of the application in light of the following remarks is respectfully requested.

I. ATTENTION TO REFERENCES NOT INITIALED

Applicants wish to bring to the Examiner's attention the following references submitted by applicants in the Information Disclosure Statement: U.S. Patent Document Number 6,576,482; Number 5,825,068; Number 6,642,100; Number 6,706,540; and Number 6,781,184. These references were submitted in an I.D.S. by applicants but have not been initialed by the Examiner to indicate consideration. Applicants respectfully request clarification regarding whether the references have been considered in the present application.

II. REJECTION OF CLAIMS 1, 14-23 and 28-41 UNDER 35 U.S.C. § 102(b)

Claims 1, 14-23 and 28-41 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 6,249,014 (Bailey). Withdrawal of the rejection is respectfully requested for at least the following reasons.

- i. **Bailey does not teach the formation of a *Low Silicon-Hydrogen Silicon Nitride* film that would avoid Hydrogen incorporation in the film and result in a FTIR value, as recited in claim 1.**

Claim 1 is directed to a method for inhibiting hydrogen related degradation in semiconductor devices having ferroelectric components by forming a SiN layer that is significantly low in silicon-hydrogen. The method comprises formation of a particular SiN layer having a higher proportion of nitrogen-bonded hydrogen relative to the hydrogen bonded to silicon therefore resulting in an FTIR absorbance ratio of 0.05 or less. Bailey does not teach this feature.

In maintaining the rejection of claims 1, 14-23 and 28-41 the Office Action states that Bailey discloses formation of a silicon nitride (SiN) film by sputtering that would avoid Hydrogen incorporation in the film. This statement is incorrect. **A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.** MPEP § 2131 (*citing Verdegaaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). Bailey does not appear to recognize that hydrogen from the SiN barrier may itself contribute to the degradation of ferroelectric components. Therefore, no disclosure of the concentration of Si-H bonding upon formation of the SiN barrier is present within Bailey, nor is any other improvement or further alteration to the barrier composition disclosed for purpose of significantly reducing Silicon-Hydrogen bonds. In column 4, lines 51-61, Bailey states:

Although the barrier material used in the preferred embodiment of this work, silicon nitride is a very good hydrogen barrier, it is still not a perfect hydrogen barrier. Given an adequately long time at elevated temperature, some hydrogen will eventually diffuse through silicon nitride or other hydrogen barrier materials. Thicker barrier layers may be used to limit the amount of hydrogen through these layers.

Bailey does not address the types of hydrogen bonding within the barrier itself, but instead suggests a thicker barrier. To suggest a thicker barrier suggests Bailey's stated intent to prevent hydrogen diffusion primarily from outside of the ferroelectric components versus both the SiN layer and from outside, as recited by the applicants. As discussed in applicants' specification (see, e.g., p. 7, Ins. 22-30), SiN material innately contains hydrogen. Further, the current applicants appreciate a method for forming a SiN film with less Si-H content that effectively inhibits hydrogen related degradation. Bailey does not disclose such a method either expressly or inherently.

- i. **Bailey does not inherently teach the formation of a *Low Silicon-Hydrogen* Silicon Nitride film that would avoid Hydrogen**

incorporation in the film and result in a FTIR value of 0.05 or less, as recited in claim 1.

To establish inherency, the extrinsic evidence “must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” MPEP § 2112 (*citing In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999)). In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. MPEP § 2112 (*citing Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)).

Neither a basis nor any technical reasoning has been provided in the Office Action to show that a low silicon-hydrogen SiN layer is necessarily inherent in the teachings of Bailey. Because a probability that the teachings may be present is inadequate, applicants respectfully submit that ***evaluation of a low silicon-hydrogen SiN layer is not necessarily present within Bailey***, and thus the reference does not anticipate the claimed invention under the doctrine of inherency.

In giving one example of how the proportion of silicon-hydrogen bonding to nitrogen-hydrogen bonding may be measured, applicants' specification discusses use of FTIR to determine the infra-red absorption and thereby the chemical composition of the SiN material. (see, e.g., p. 22, lns. 26-30). No teaching is provided in Bailey that indicates any such measurements are made or contemplated. Rather, Bailey discusses only the addition of a hydrogen barrier through several processes available. Consequently, ***use of low silicon-hydrogen bonding does not necessarily occur in the cited reference*** and thus the cited art does not anticipate the claimed invention under the doctrine of inherency. Accordingly, withdrawal of the rejection is respectfully requested.

III. CONCLUSION


For at least the above reasons, the claims currently under consideration are believed to be in condition for allowance.

Should the Examiner feel that a telephone interview would be helpful to facilitate favorable prosecution of the above-identified application, the Examiner is invited to contact the undersigned at the telephone number provided below.

Should any fees be due as a result of the filing of this response, the Commissioner is hereby authorized to charge the Deposit Account Number 50-1733, TIP288US.

Respectfully submitted,
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CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date: June 13, 2005


Christine Gillroy